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Contributions to American Bryology—IX.

By Elizabeth G. Britton.

(Plates 229–231.)

I. The Systematic Position of Physcomitrella patens.

It must have occurred to every student of the mosses of the United States that the foot-note* at the bottom of page 39 of Lesquereux and James' Manual indicated a curious state of classification, and this feeling is increased when a study of the specimens and literature convinces him that the facts which have been taken for fixing arbitrary lines are still open to question and have been disputed by several well-known bryologists. The questions in doubt are these:—Has *Physcomitrella patens* a dehiscent, differentiated, lid? and is it distinct generically from *Aphanorhegma?* We propose to answer both these questions in the affirmative.

The history with regard to European specimens is best shown by the following citations:—

Physcomitrella patens (Hedw.) Br. & Sch.

Phascum patens Hedw. Descr. 1: 28. *pl. 10* (1787).

Physcomitrella patens Br. & Sch. Bryol. Eu. 1: *pl. 3* (1849).

Aphanorhegma patens Lindb. in Ofv. K. Vet. Akad. Forh. 580 (1864).

Limpricht (Rab. Kryptfl. 4: 174. 1886) and Braithwaite (Brit. Mosses, 2: 127. 1890) maintain *Physcomitrella* as a genus and state that the capsule is indehiscent, or the lid not differentiated; hence the former places it among the cleistocarpous mosses, and the latter, following Lindberg and Hampe, classes it with the Funariaceae. The latter is undoubtedly its most natural alliance. Lindberg claims to have seen the lid. Schimper in the last edition of the Synopsis Muscorum (1876) says that he has not seen it.

"De operculi vestigi a Clarissimo Lindberg laudato adhuc nil vidi."

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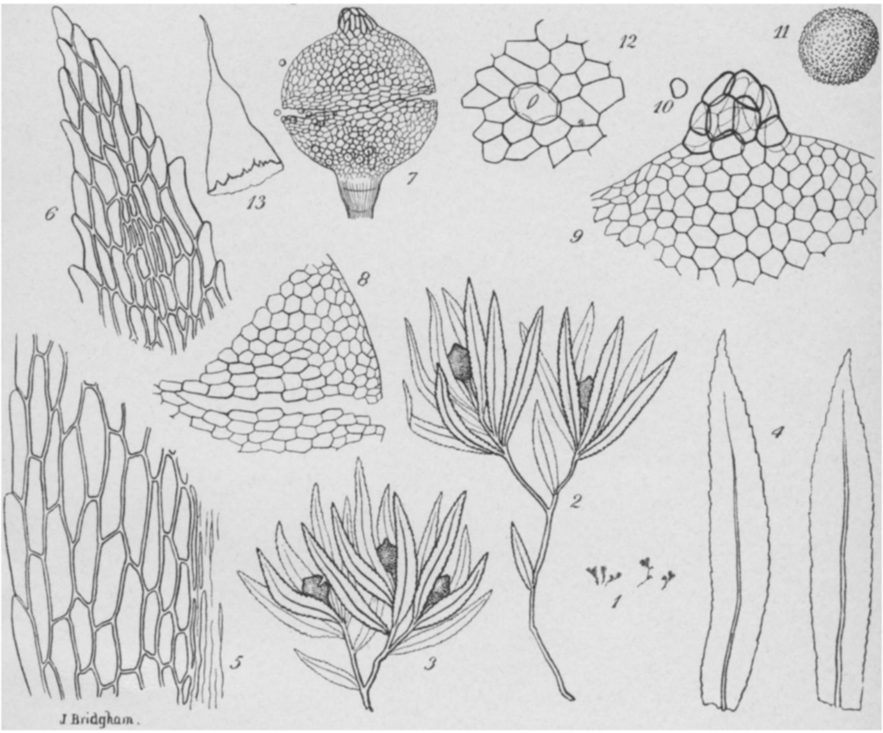
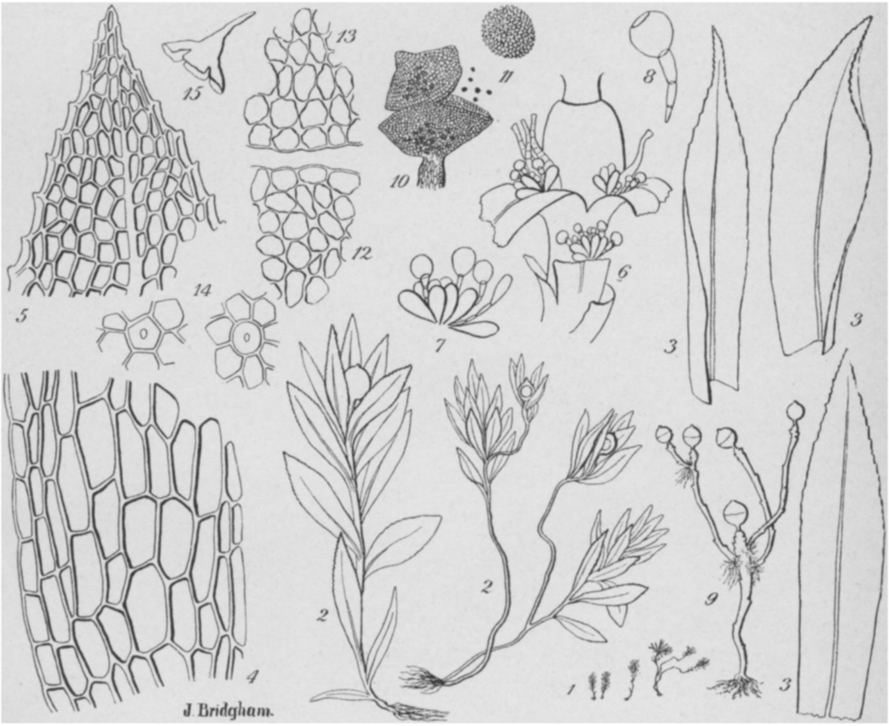
*"*Aphanorhegma serratum*, Sulliv., differs from this species (*Physcomitrella patens*) only in the regular dehiscence of the capsule, which divides in the middle and is therefore considered as operculate or stegocarpous, though no discoloration nor any kind of modification of the texture is observable on the line of disruption. But for this regular dehiscence *Aphanorhegma* should be described here merely as a variety of *Physcomitrella patens*. It is therefore a remarkable connecting link between the Ephemereae and the Physcomitrieae, which resemble each other also in the areolation of the leaves."

BULLETIN OF THE TORREY BOTANICAL CLUB.—PLATE 229.

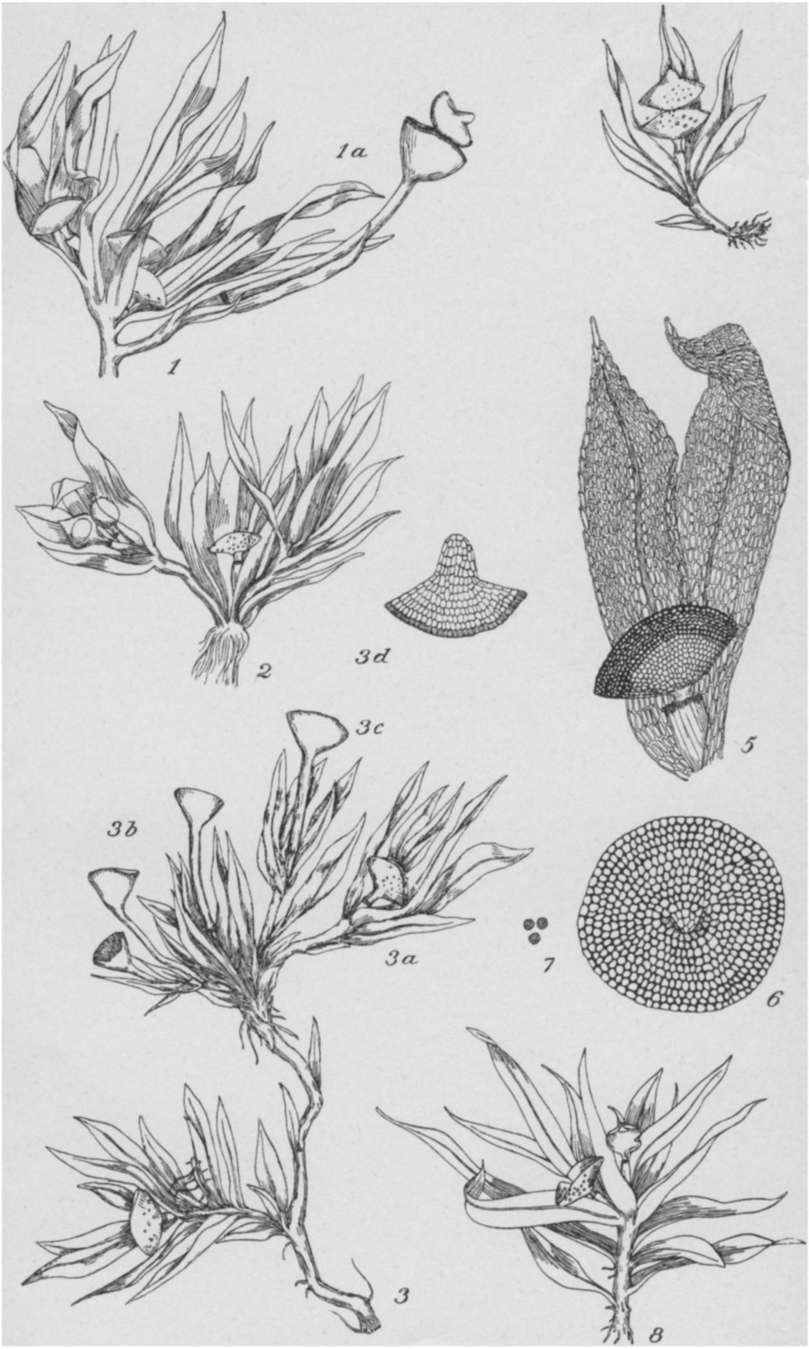


PHYSCOMITRELLA PATENS (HEDW.) BR. & SCH.

BULLETIN OF THE TORREY BOTANICAL CLUB.—PLATE 230.



APHANORHEGMA SERRATA SULLIV.



A HYBRID OF APHANORHEGMA SERRATA.

We have taken pains to see all the available American material of *Physcomitrella patens* in the Sullivant herbarium as well as in that of the Department of Agriculture and others. In Drummond's Southern Mosses, No. 5, collected near St. Louis, the specimens are still in perfect condition for examination. Many of the capsules have not split, but several of those which have show with a low magnification a perfectly circular rim. Under a high magnification, after boiling and mounting, the walls are torn irregularly, but a distinct median line of separation, where the cells are elongated with longer transverse walls, was seen, even on the irregularly torn capsules.

No. 30, Sull. & Lesq. Musci Bor. Am. Ed. 2 (1865), collected in Ohio, also are in fine condition. Few of the capsules have split, but after mounting in glycerine jelly, three capsules did split regularly in half, and although we have seen no differentiation of the cells along the suture, yet from its regularity, we suspect it is there. It is almost impossible to determine this after the dehiscence of the capsules, as the walls are so thin, the cells so tender, that in boiling to get rid of the spores, the walls are injured beyond possibility of examination. The stomata are basal, and seem partly immersed.

In Sullivant's own herbarium we found specimens from Columbus, Ohio, collected in 1852, several capsules of which had split regularly in half as seen by reflected light with a low power.

Quite recently we have received from Fort Snelling, Minnesota, specimens collected by Grace E. Sheldon on October 1, 1894, which show a differentiation of the cells around the middle of the capsule. Fig. 8 of our plate was drawn from these specimens. These capsules are very fresh and young, the cells of the walls still contain chlorophyll, and are more distinct than any we have seen. Starting from the stomatose base, the longest diameter of the cells is vertical, they measure .013×.027 mm., gradually the cells become larger, still keeping their longest diameter vertical, and twice the length of the shortest, measuring .027×.054. At the line of dehiscence the cells are transversely elongated, three times longer than wide, and measures .016×by .054 mm.

Taking the above observations only for what they are worth, it seems to me that we may at least give the question the benefit of a doubt, and would advise any one having access to fresh material of this rare and interesting species, and who is familiar with modern laboratory methods, to do some careful bleaching and staining, and try to prove conclusively whether *P. patens* belongs with the Cleistocarpous mosses or not.

The stomata as figured by our artist do not agree with fig. 59 of Limpricht's Laubmoose (Rab. Kryptfl. 4 : 158), but in all our specimens they seem to be more or less immersed, and it is only in deep focussing that the outlines appear distinct.

There seems to be some uncertainty as to the position of the antheridia in *Physcomitrella patens*. Schimper in the Bryologia (*t. 3*) figures them in basal buds, but in the Synopsis Muscorum (Ed. 2, 1876) he corrects himself, saying they are axillary to the upper leaves. As in *Aphanorhegma* they have also globose-tipped paraphyses.

Limpricht says they may be either naked and pseudolateral under the perichaetium or on a branch, seldom at the base of the vaginule; the paraphyses may be thread-like or globose-tipped. We have not been able to verify any of these statements from fresh American material.

The genus *Aphanorhegma* was founded by Sullivant in 1848 (Gray's Man. Ed. i., 647. 1848). *Physcomitrella* was not published till 1849 (Br. & Sch. Bryol. Eu. fasc. 42). In his search after earlier names, Lindberg seems to have allowed dates to have more weight than facts. From the accompanying plates and descriptions, it seems to me that we cannot consider *Physcomitrella patens* and *Aphanorhegma serrata* as congeneric, much less is one "merely a variety of the other."

Description of Plate 229, Physcomitrella patens (Hedw.) Br. & Sch.

1. Plants, natural size.

2–3. Two enlarged, showing the immersed capsules.

4. Outlines of leaves.

5. Half of the base of one leaf enlarged, showing cells.

6. Apex enlarged.

7. Capsule enlarged, showing the stomatose base, and irregular line of dehiscence, the parenchymatic walls and large apical cells.

8. Cells of the walls still further enlarged, showing the transverse elongation of those in the middle of the capsule, the hexagonal ones above.

9. Apex of capsule enlarged.

10. Spore.
11. Same much enlarged, showing the spines.
12. Stoma, enlarged, showing the overlapping cells.
13. Calyptra.

Description of Plate 230, Aphanorhegma serrata Sull.

1. Plants, natural size.
2. Same, enlarged.
3. Outlines of leaves.
4. Cells at base of one side of leaf.
5. Cells of the apex.
6. Perichaetial leaves removed, showing the antheridia mixed with the archegonia in the upper axils.
6–7, Distinct antheridial clusters.
8. One of the globose-tipped paraphyses.
9. Leaves removed, showing the subapical innovations of the stems and the nearly sessile capsules.
10. Single capsule enlarged, showing median dehiscence and flaring rim.
11. Spores, one enlarged, showing spines.
12. Collenchyma cells below the mouth showing the thickened walls.
13. Cells of lid.
14. Two stomata enlarged.
15. Calyptra.

2. ON A HYBRID GROWING WITH APHANORHEGMA SERRATA Sull.

(PLATE 231.)

These specimens were distributed in Drummond's mosses of the Southern States (1841) as No. 20, labelled as follows:

> *Schistidium serratum*, nov. sp.
> Foliis obovatis acuminatis sub apicum serratis, capsula hemisphaerica.
> Near St. Louis, growing with *Phascum serratum*.

In the set belonging to the Columbia College Herbarium, there is an unmistakable hybrid between *Aphanorhegma serrata* and an unknown *Physcomitrium*, probably *P. turbinatum*, though, of course, the hybrid is not characteristic, as the archegonial plant was *Aphanorhegma*, and the antheridial plant was not distributed and could not be as easily determined.

Aphanorhegma serrata ♀ × *Physcomitrium turbinatum* ♂ (?).

Schistidium serratum Hook. & Wilson in Drummond's Southern Mosses no. 20 (1841).

Plants 3–5 mm. high, gregarious, bushy; stems branching and rooting at base of the innovations; leaves crowded, 2–3 mm. long, lanceolate or oblanceolate, from an oblong base, margins serrate above, marginal cells inflated with oblique walls; vein ending below the apex, or excurrent into the subulate tip. Sporophyte of two kinds. The normal, immersed ones of *A. serrata*, splitting in half when mature, becoming broadly flaring, with several rows, 8–10, of dark collenchymatic cells bordering the mouth and forming the whole of the lid; the spores rough, .024–.027 mm. The hybrid sporophytes exserted; seta 2–6 mm.; capsule turbinate, not splitting in the middle, but with a smaller apical lid, which is bordered by one row of denser cells and is composed of parenchymatic cells, as well as the walls of the capsule; mouth bordered by two rows of dense oblong cells, and a persistent well-differentiated annulus; spores .016–.018 mm., immature.

Type locality near St. Louis, Missouri; type specimen No. 20, Drummond's Southern Mosses, in the Herbarium of Columbia College.

I wrote to Kew for information concerning Hooker and Wilson's specimens, and Mr. Wright says they also have a mixture in Drummond's No. 20, but he does not mention any exserted capsules. "Some of the plants have broad leaves, similar to those of *Phascum patens*, as is shown by Sullivant in Mem. Acad. n. ser 3:60. *t. 11* (1848) and in Sullivant's Icones, *t. 57*. Others have longer, narrower leaves, and an almost sessile capsule, with a regular operculum. On another specimen (13b, Mississippi, Drummond) Wilson has written 'In this tuft is also found *Phascum patens*.'"

Drummond's specimens were supposed to be the ones on which Sullivant founded his genus *Aphanorhegma*, but it is clear, on consulting his herbarium, that his set of Drummond's mosses could not have supplied the figures which are given in the Memoirs of the American Academy (3: 60. *t. 2*. 1848), for he had only a few old ragged plants of No. 20 with deoperculate capsules. He distributed in the Musci Alleghanienses No. 198 (1846) specimens from Virginia and Ohio, as *Schistidium serratum*, and in the original description of *Aphanorhegma* in Gray's Manual he makes no mention of Drummond's specimens, and gives the distribution "from New England to Ohio." These must be the types of the genus, and the ones figured in the Icones Musc. *t. 57*.

Description of Plate 231.

All the plants taken from Drummond's Southern Mosses, No. 20.

1. A plant of *Aphanorhegma serrata* bearing three normal capsules, old, immersed and empty, with a flaring mouth, broader than the depth of the capsule; the spores measure .024–.027 mm., and are rough and brown.

1a. Hybrid sporophyte, with exserted seta 6 mm. long, the capsule not splitting in the middle, but with a smaller lid, the mouth bordered by two rows of cells and an annulus, the spores imperfect, .016–.018 mm.

2. A plant of *Aphanorhegma serrata* with one old, flaring, immersed capsule, spores .024–.027 mm.; to the left, on a separate branch, two younger capsules, immersed and immature.

3. The lower plant is *Aphanorhegma serrata* with a single immersed flaring capsule, the spores .027–.029 mm.

3a. Another immersed, flaring capsule with mature spores .027 mm. in diameter.

3b. Four other branches, all bearing exserted capsules, less flaring than the other two and bordered by only two rows of cells with a distinct annulus, the spores imperfect and massed together in the sporesac.

3d. was found in place on 3c., but in boiling it fell off. It will be seen that the cells of the lid are quite different from that of Fig. 6.

4. A simple, unbranched plant of *Aphanorhegma serrata*, showing the shape just after dehiscence.

5. Same, enlarged, showing the 8 rows of thick, collenchymatic cells bordering the mouth.

6. Lid of same, enlarged; also composed of collenchyma.

7. Spores spinosely roughened, .024–.027 mm. from Fig. 4.

8. A normal plant of *Aphanorhegma serrata* with two capsules, one old and flaring, the spores .024–.027 mm., the other just splitting in half, with the calyptra still on.

3. On a European Hybrid of Physcomitrella patens.

There has been recorded in Europe another hybrid which makes a curious parallel between *Aphanorhegma* and *Physcomitrella*, and it seems to have puzzled European bryologists, for they do not agree in the interpretation of the facts. The synonymy is as follows:

PHYSCOMITRELLA HAMPEI Limpr. (Rab. Kryptfl. 4: 175. 1886).

Physcomitrella patens × *Physcomitrium sphaericum.*

Physcomitrella patens var. *pedicellata* Br. & Sch. Br. Eu. *t. 3y* (1849).

Ephemerum patens var. *anomalum* Hampe in sched.

Aphanorhegma patens var. *anomalum* Hpe.; Lindb. in Ofv. K. Vet. Akad. Förh. 580 (1864).

Physcomitrella patens var. *anomala* Hpe.; Milde in Bryol. Sil. 191 (1869).

Milde says of it that the capsules are long-stalked with unmistakable indications of a lid. These specimens were collected at Blankenburg in the Harz Mountains by Hampe.

Schimper, Hampe, Lindberg, Braithwaite, Husnot, Sullivant and Lesquereux and James (our American authorities probably cited the European) all state that *P. patens* may have the capsules either immersed or exserted, and Boulay states that it is very variable and that the different forms may be found growing "pell-mell" in the same locality.

Limpricht, in a foot note to his description of *P. Hampei*, says that Lindberg claims to have seen this form in the axils of the leaves of *P. patens* but that he has never seen it.

We have a slight addition to make from our own observations, for in the Jæger Herbarium we find authentic specimens of Hampe's labelled: "Ephemerum patens var. anomalum. Seta exserta. p. Blankenburg. Ex. herbar. E. Hampe, 1865." These specimens show what Limpricht says he has not seen, two kinds of capsules on the same plant.

One plant which we have mounted has two capsules; the lower one small, immersed, with thin walls and characteristic large apical cells of *Physcomitrella patens*. The other is exserted on a thick seta 2 mm. long, with regular distinct cells in the walls of the capsules and a differentiated lid. The exserted capsules are almost all either young or aborted, so that no spores have been seen, but one old capsule has been found with the lid off, showing the mouth bordered with an orange-colored rim of cells and a distinct annulus. The immersed capsules are on the lower part of the plants, as in our hybrid; most of the capsules are older and have perfected their spores with measure .024–.027 mm. and are rough.

Japanese Characeae—II.

BY T. F. ALLEN.

11. *Chara coronata* Ziz., collected in Province Ise, differs in no essential point from the forms of Nos. 2 and 3.

12. *Nitella Japonica* Allen, from a new locality in Province Ise, namely Yamagami; distributed with No. 14, under the exsiccatae number 9.